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VISUAL SELECTIVE ATTENTION(U) MEDICAL RESEARCH INST OF 1/1
SAN FRANCISCO CA K NAKAYAMA 30 MAR 84 AFOSR-TR-84-0774
AFOSR-83-0320

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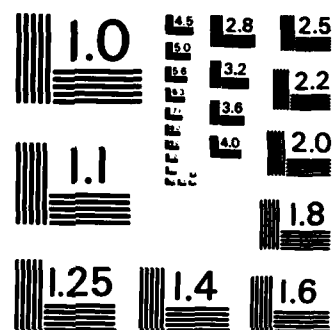
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Annual Scientific Report
30 March 1984
AFOSR-83-0320

AD-A146 220

Visual Selective Attention

Medical Research Institute
Smith-Kettlewell Institute
2200 Webster Street
San Francisco, CA 94115

Dr. Ken Nakayama

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REPORT DOCUMENTATION PAGE

1. SECURITY CLASSIFICATION UNCLASSIFIED		1b. RESTRICTIVE MARKINGS	
2a. SECURITY CLASSIFICATION AUTHORITY		3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited.	
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE			
4. PERFORMING ORGANIZATION REPORT NUMBER(S)		5. MONITORING ORGANIZATION REPORT NUMBER(S) AFOSR-TR- 34-0774	
6a. NAME OF PERFORMING ORGANIZATION Medical Research Institute Smith-Kettlewell Institute	6b. OFFICE SYMBOL (If applicable)	7a. NAME OF MONITORING ORGANIZATION AIR FORCE OFFICE OF SCIENTIFIC RESEARCH /NL	
6c. ADDRESS (City, State and ZIP Code) 2200 Webster Street San Francisco, Ca 94115		7b. ADDRESS (City, State and ZIP Code) Bldg # 410 Bolling AFB, DC 20332	
8a. NAME OF FUNDING/SPONSORING ORGANIZATION AFOSR	8b. OFFICE SYMBOL (If applicable) NL	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER AFOSR-83-0320	
8c. ADDRESS (City, State and ZIP Code) Bldg 410 Bolling AFB, DC 20332		10. SOURCE OF FUNDING NOS.	
		PROGRAM ELEMENT NO. 61102F	PROJECT NO. 2313
		TASK NO. A5	WORK UNIT NO. /
11. TITLE (Include Security Classification) VISUAL SELECTIVE ATTENTION			
12. PERSONAL AUTHOR(S) Nakayama, Ken			
13a. TYPE OF REPORT Annual	13b. TIME COVERED FROM 09/01/83 TO 03/30/84	14. DATE OF REPORT (Yr., Mo., Day) 1984, March 30	15. PAGE COUNT 3
16. SUPPLEMENTARY NOTATION			
17. COSATI CODES		18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)	
FIELD	GROUP	SUB. GR.	
19. ABSTRACT (Continue on reverse if necessary and identify by block number)			
<p>This technique has been used to differentially localize neural activity associated with sinusoidal grating onset and offset in different evidence that the field potentials recorded on the surface of the occipital lobe originate in an area other than the primary visual cortex. Because current source density analysis has such great ability to localize the origins of visual evoked potentials, this technique can also be applied to examine the origin of attention-related potentials. It is expected that the results of this study will aid in the interpretation of event-related potentials in humans.</p>			
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT UNCLASSIFIED/UNLIMITED <input checked="" type="checkbox"/> SAME AS RPT. <input checked="" type="checkbox"/> DTIC USERS <input type="checkbox"/>		21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED	
22a. NAME OF RESPONSIBLE INDIVIDUAL Dr. Genevieve M. Haddad		22b. TELEPHONE NUMBER (Include Area Code) 202-767-5021	22c. OFFICE SYMBOL NL

Chief, Technical Information Division

The Forecast and Progress Report

Selective visual attention has received considerable interest of late. Mounting evidence indicates that the "mind's eye" can roam covertly over the visual field at will, lowering thresholds and decreasing reaction time in this region of the visual field (Posner, 1982). Furthermore, it has been hypothesized by Treisman (1980) that the process of selective visual attention may have the important function of synthesizing the disparate features of the visual image which are analyzed in many different visual cortical projection areas (see Allman and Kaas, 1975).

Both single unit electrophysiology in monkeys and massed evoked potential studies in humans show reliable correlates of selective visual attention (Galambos and Hillyard, 1981). The major goal of the present research is to elucidate fundamental mechanisms of visual selective attention by finding an electrophysiological correlate of selective visual attention in monkeys which is comparable to those described in humans. Then we propose to determine the anatomical locus of these changes using the technique of current source density analysis. If successful, such an endeavor will provide an important bridge between human psychophysiological studies of visual attention using evoked potentials and current concepts regarding the anatomical organization of the occipital and parietal cortex in primates.

In order to accomplish this goal, we have purchased a new laboratory computer (PDP 11/23) with funds provided by this research grant. We chose this machine because most of the required applications software for our project has been developed over the past five years at the Max-Planck-Institute in Munich (F.R.G.) for this machine by Mr. Helmut Zucker. We also purchased a Winchester hard disk to have an adequate capacity to store data of many single trials, and the needed interface equipment (clock, ADC, DAC, DIO, etc). Hardware interfaces for the computer have been constructed, tested and debugged. Thanks to a very productive two-week visit by Mr. Zucker in January 1984, these interface functions are now working in conjunction with his software. This includes the smooth working of a graphical output package incorporating a 613 storage oscilloscope coupled to our hardcopy printer.

The main purpose of this software package is to offer to the investigator a specialized programming environment where multichannel analogue data can be sampled, filed efficiently, and easily manipulated by the investigator, without much help from computer specialists. At present we have tested a significant portion of the software package and are now in the process of making the needed modifications so as to make it applicable to our own particular needs, especially in terms of presenting particular blocks of stimulus sequences.

We are also making some technical changes in electrode manufacturing and testing. We have some thin-film miniaturized electrodes manufactured by O. Prohaska in Vienna. These electrodes have been tested in physiological experiments for current source density measurements in the

rabbit visual cortex (Rappelsberger, et al., 1982) and will also be used to examine the origin of visual evoked potentials in monkey cortex (Spekreijse, personal communication). With regards to testing, we are in the process of developing some new in-vivo electrochemical techniques to more conveniently assure the uniformity of electrode characteristics for the duration of chronic implants.

In parallel, we are also conducting experiments with our existing computer and electrode system. Only when the new techniques have been adequately pretested will we replace our present set-up. The proposed experiments for the near-term will concentrate on spatially directed visual attention. This will require that a subject fixate a portion of the visual field, yet forcing a subsidiary awareness at another portion of the visual field by the appropriate behavioral paradigms. These different stimuli are presented in different regions of the visual field and the response to each will be assessed in terms of its proximity to the region of spatially directed attention.

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